

Overview of fire curtains in construction

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Abstract. A fire curtain is used where, if there is a fire, it is necessary to create a temporary barrier within an opening, which seals off the area on fire. The curtain descends and prevents any fire and smoke from spreading from one area to another. It also allows people access to protected escape routes without any loss of fire resistance. The paper aims to present the results of analysis of the scientific literature on the subject of fire curtains.

1 Introduction

In modern scientific, regulatory, and legal and technical literature, the term "fire curtains" refers to the structure, preventing the fire from spreading through the building and its hazards (heat flow, smoke, CO, CO₂, HCL et. al.). Fire curtains also known by the terms "fire-retardant curtains," "Smoke curtains", "fire and smoke curtains". Under these terms, in all their diversity we mean the curtains to prevent the spread of fire hazards.

Performing the function of a fire barrier, curtains only when necessary (in case of fire) cut off the individual volumes and escape routes of the total building space. For example, fire curtains with degree of protection EI 60, 120 or 180 do not allow the fire to spread to the neighboring room. Fire curtains are a new type of fire protection. They can be used not only in the design and construction of new buildings, but also in the reconstruction of existing buildings [1].

2 Methods

Fire curtains are certified in accordance with the BS EN 949, BS EN 1634-3, BS 5234-2, BS EN 1363-2, BS EN 1634-1, BS EN 1363-1, BS EN 12605, BS EN 13501-2. In Russia, curtains are certified in accordance with the Technical regulations for fire safety requirements [2], National standards of Russia 30247.0-94, 30247.1-94, 53305-2009, 53307-2009 [3 – 6].

3 Results

The aim of fire protection system's usage is to maintain the temperature of the building component (structural steel element, electrical installation) below the critical temperature during fire but also is intended to contain a fire in the origin fire compartment for a limited period of time. In the paper [7] the passive fire protection material solutions were described

and their action mode explained. The paper [8] presents findings from comprehensive research on influence of fire barrier on fire performance of External Thermal Insulation Composite System – ETICS with combustible thermal insulation. To confirm findings, tests on identical ETICS systems were conducted in March 2014 and May 2014.

The authors [9] proposed a new way, which consists in the enclosure securable object retardant screen, in which the porous structure materials at creation environment vapor of coolant is shown a continuous physical effect of evaporative cooling.

The paper [10] describes how to use fire-screens and curtains, as part of an automatic fire protection system, in particular in the high-rise warehouse with shelves. Described in detail the action of fire barriers in case of fire in the warehouses. Table 1 provides information of fire curtains.

Table 1. Comparison of fabricators curtains.

№	Fabricator (brand)	Tested according to	Fire resistance	Manufacturer country	Official site
1	Stöbich Brandschutz GmbH	EN 1634-1 EN 13501-2	EI 90 EI 120 EI 180	Germany	stoebich.com
2	Fogo	EN 1634-1 EN 13501-2	E 60 E 120 EW 120	Lithuania	fogo.lt
3	FireScreen	EN13501-1	E 30	Netherlands	firescreen.com
4	Firetechnics	National standards of Russia [3 – 6]	EI 60 EI 180	Russia	fire-tec.ru
5	Pulsar Doors	National standards of Russia [3 – 6]	EI 30 EI 90	Russia	pulsardoors.ru
6	Door Master	National standards of Russia [3 – 6]	EI 60	Russia	doormaster.ru
7	Bach	EN 1634-1 EN 1634-3	EI 120 EI 180	Spain	bach-sl.com
8	Naffco	NFPA 252, UL 10D, FM Global, BSI, EN.	Optional	United Arab Emirates	naffco.com
9	Bradley Lomas Electrolok	EN 1634-1 EN 13501-2 et.al.	EI 120 EW 120	United Kingdom	ble-smokeandfirecurtains.com
10	Coopersfire	BS EN 1634-1:2008	E 120 E 180 EW 60 EI 120	United Kingdom	coopersfire.com
11	Colt Group	EN 1634-1 EN 13501-2	E 60 E 180	United Kingdom	coltgroup.com
12	FireCurtains	EN 1634-1 EN 13501-2	E 60 E 240	United Kingdom, India, Poland	firecurtainsltd.com
13	Smoke Guard	NFPA 252, UL 10D	Fire resistance up to 2 hr.	United State of America	smokeguard.com
14	Newtex	ASTM D6413, ASTM E-84,	Optional	United State of America	newtex.com

Usually fire curtains are manufactured from a woven glass fibre fabric with stainless steel wire reinforcement. The fabric is coated on each side with silver polyurethane. The complete curtain assembly is rated at 1000°C for a period of up to 240 minutes for Integrity (E), and 60 minutes for Irradiation (W), depending on the size of the curtain. Fire curtains are manufactured in many countries. Fire curtains are popular decision on fire safety in construction.

For Russia this is possible is a relatively new solution for fire safety [1]. For example, the company Stöbich Brandschutz GmbH develops and produces fire curtains for 15 years [11].

Figure 1 – example application of fire curtains.

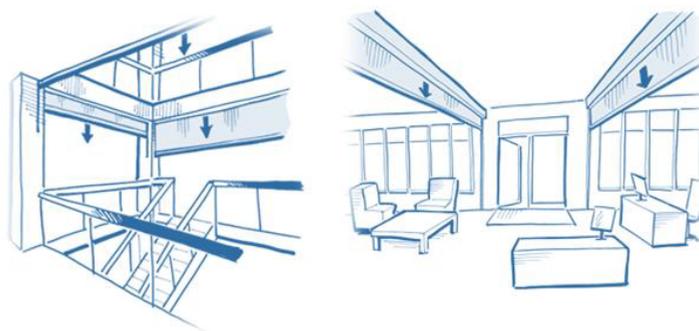


Fig. 1. Example application of fire curtains in construction

Fire curtains are made of silica material and are well suited to prevent the spread of fire hazards in buildings with an atrium. As a demonstration of the spread of fire hazards presented calculation of materials in the GUI FDS PyroSim, Smokeview (figure 2 – 3).

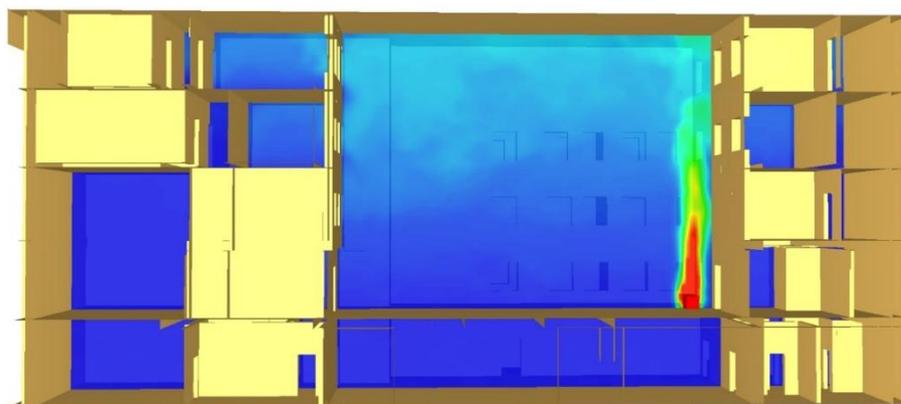


Fig.2. – Distribution of hazardous fire factors elevated temperature



Fig.3. – The spread of fire hazards for the loss of sight

Figure 4 demonstrates the fire resistance ability of the fire curtains it is Fire Dynamics Simulator model.

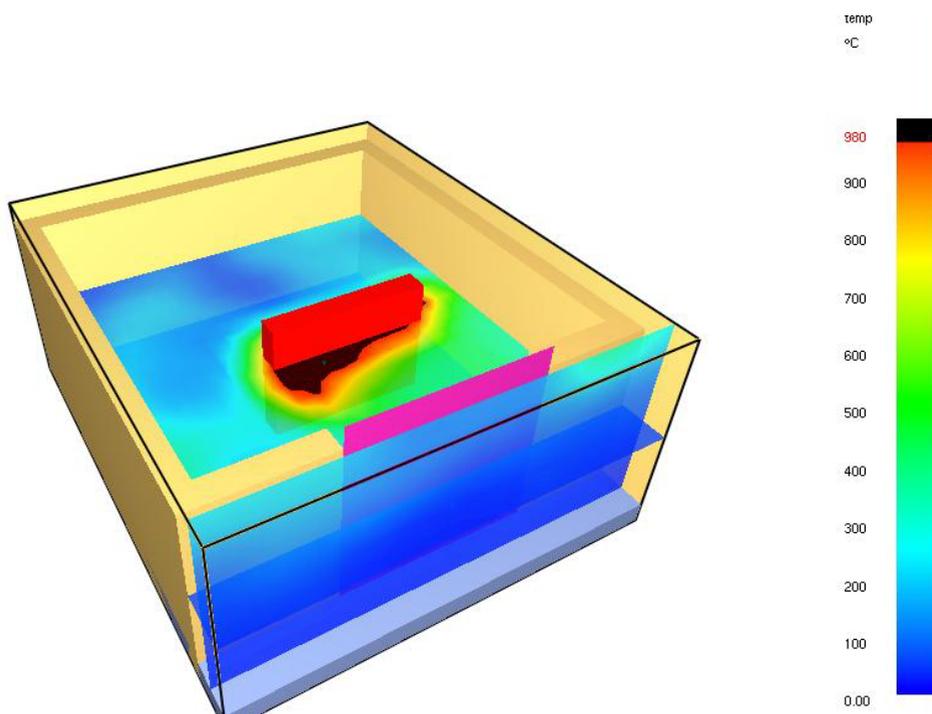


Fig.4. – Fire resistance ability of the fire curtains

CONCLUSION

If the Fire Curtains do not deploy to their operational position, the fire-engineered design solution would be compromised. However, in the event that other fire protection systems or elements do not function, e.g. due to total power failure, the Fire Curtains in the fire-operational position provide fire separation.

Automatic fire-fighting systems to bring the curtains in the operation have probability of failure of 0.99. There are systems, which exclude the electro-mechanical components,

which is a more reliable means.

Fire curtains is a good tool for fire protection in civil engineering. The use of fire curtains allows you to keep the aesthetic appearance of structures. Materials used in fire curtains can be used for fire protection of structures. [12 – 13]

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